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SUGGESTIONS FOR IMPROVEMENT OF DEFECTIVE NEGATIVES.*

BY J. VON NORATH.

OF all the photographic manipulations, the most important one is to obtain a satisfactory or perfect negative, consequently it becomes a matter of more or less difficulty.

It is therefore not to be wondered at that almost all photographers are more or less concerned in everything that tends to improve or simplify this important process. How this matter is appreciated by the scientist and manufacturer may be judged from the continual seeking after new and improved developing agents, the promulgation of formulæ, and the advertisements of new varieties of dry plates and films.

Notwithstanding that so much has been already accomplished in this department, and is known and understood, it still remains a fact that many of the simple methods by which a defective or inharmonious negative can be improved and made available, are not used to the extent they should be, on account of not being sufficiently known.

Now and then recourse is taken by the every-day worker to improve a negative by intensification, whether the proper thing to do or not, while others again look to the retoucher, no matter how good or incompetent he may be, to harmonize the existing defects.

* Translated and amplified by J. F. Sachse from the Deutsche *Photographen-Zeitung*.

Now as no one remedy will answer for every defect, it is proposed here to exemplify and explain, separately and in a practical manner, the various known processes for the improvement of a defective or unsatisfactory negative.

The most frequent defect in a negative consists of a veil or fog. This is usually caused by the use of too highly sensitive plates, together with extra light strong objectives, but it may also result from many other causes.

The above defect is divided into two classes, viz.: plain fog and colored fog.

Both varieties can be entirely removed, provided the proper methods are employed, which are different according to the kind of fog.

An ordinary fog, which certain makes of plates seem to be subject to, may be removed expeditiously and with certainty by the application of any slow-acting reducing medium, one of the best of which is the simple acid-fixing bath.

Sulphuric acid - - -	1 drachm.
Hyposulphite of sodium - -	16 ounces.
Sulphite of sodium - -	2 ounces.
Chrome alum - - -	¾ "
Warm water - - -	64 ounces.

Dissolve the hyposulphite in 48 ounces of water, the sulphite of soda in 6 ounces of water, mix the sulphuric acid with two ounces of water, and pour slowly into the sulphite sodium solution, and add to the hyposulphite, then dissolve the chrome alum in 8 ounces of water and add to the bulk of the solution, and the bath is ready.

Immerse the fogged negative in this bath, and allow it to act until the requisite clearness in the shadows is reached.

Of the numerous existing formulæ for the reduction of negatives, none offers the advantages for clearing fog and gives the results equal to what is known as Belitski's permanent green reducer; this is made as follows:

Water - - - - -	7 ounces.
Potassium ferric oxalate - -	2½ drachms.

When this is dissolved add

Crystallized neutral sulphite of sodium	2 drachms.
Oxalic acid - - -	40 grains.
Hyposulphite of soda - - -	1½ ounces.

This even-acting reducer must be kept in corked bottles in the dark, as under the influence of light the ferric salt is reduced to ferrous. This solution may be used repeatedly, as, if care is taken, it keeps a long time.

Green, yellow or red fog, however, are not to be removed by reduction, as they are caused by a peculiar condition of the reduced silver. It is, therefore, recommended to change the latter once again into a silver bromide, and then by suitable development obtain the desired grey-black argentic reduction, with corresponding clearness in the shadows. The procedure to obtain these results is a simple one, and the results are sure in *almost* every instance.

When we say *almost* it must be taken into consideration that any discoloration arising from the oxidation of the developing agent will not yield to the above method, but must be treated by a method of its own.

To overcome the first defects, viz., green, yellow or red fog, it is suggested to first place the dry negative in water for about ten minutes, so as to thoroughly soften the film, then place in a solution of

Water - - - - -	3½ ounces
Bromide of soda - - -	75 grains
Bromine - - - - -	45 grains

This mixture is to be thoroughly mixed by shaking in a well-corked bottle. Place the negative in a tray, and then pour the solution over it; this must be done in the open air, as strong, noxious fumes are generated.

In this bath the negative bleaches out completely, and appears on the reverse as a positive. It is then to be well washed, after which it is to be re-developed with a fresh solution of any developing formula. This can be done by daylight. According to the German writer, hydrochinone gives the best result for the final operation. The development is to be continued until the plate

appears black, and by transmitted light appears grey-black. Reddish or brown tones are transitory only, and are not to be taken into account as they disappear with continued development.

The time of development is of no moment, as it has no detrimental effect whatever, the only aim being to obtain the desired grey-black tone with the requsite clearness in the shadows.

When the re-development is complete the negative should be washed for about two hours. It is to be noted that some brands of plates show a tendency, after being put through this treatment, to frill, or even peel off the glass; this is to be overcome by placing the negative in an alum bath for two minutes prior to the final washing. More certain results are however to be obtained by the use of a weak solution of chrome alum.

Ordinary yellow fog yields easily to treatment with a Thiosinamin solution which has less objectionable features than the above:

Thiosinamin - - - - -	5 drachms
Citric acid - - - - -	2½ "
Water - - - - - -	1 quart.

The negative is merely placed in the above until cleared; the result is permanent.

When the yellow discoloration is the result of oxydation of the developing agent the best procedure is that indicated by Dr. Leisegang. If resulting from the use of paramidophenol; immerse and bleach in a solution of oxalic acid, then expose the plate for two hours to bright sunlight without any previous washing.

Pyro stains may be easily removed with a solution of citrate of tin (*citronen saurem Zinn*) less thoroughly with a solution of sulphite of sodium.

Amidol fog can only be partially removed by the use of either of the two above solutions.

As the stannic salts are apt to act upon the gelatine film, it is best under all circumstances to avoid their use, and take recourse to other methods, even, if not quite so effective, such as placing a blue glass in front of the negative in the printing frame, as the

resulting green light will give better prints than can be obtained by printing merely through the yellow film.

We now come to another class of defect, such as a negative where, while there is no lack of detail, yet the high lights are too dense. Many are the suggestions that have been made to overcome this difficulty, the following have been tried and found practical:

The well washed negative is to be treated either with the above bromizing solution, or one of

Hydrochloric Acid - - - -	8 drops.
Bi-chromate of Potash - - -	30 grains.
Alum - - - - - -	15 grains.
Water - - - - - -	1 ounce.

With this solution a silver chloride is formed, which is not so apt to give sure results. As a substitute for the bromizing solution previously given, the following formula has been suggested, as it does not evolve any noxious fumes:

Bromide of Potassium - - -	1 drachm.
Bi-chromate of Potash - - -	30 grains.
Water - - - - - -	6 ounces.

The thoroughly bleached negative is to be slightly washed and then re-developed with a good Hydrochinone developer.

A.	Hydrochinone - - - -	1 drachm.
	Sulphite of Sodium - - -	4 drachms.
	Acetic Acid - - - -	1½ drachms.
	Water - - - - -	5 ounces.
B.	Carbonate of Potassium - -	2 drachms.
	Water - - - - -	2½ ounces.

For use two parts of A to one part of B

The development is to be carried on only until the details in the shadows and half-tones are well brought out, while the high lights still appear light on the glass side, but by transmitted light show a harmonious density.

The negative is then to be washed for a short time and fixed in an ordinary fixing bath. By this method, either a soft or plucky negative can be obtained.

Another method recommended for harmonizing under-exposed and hard negatives, and which has given good results, is one

based upon the special properties of stained gelatine. The negative after being dried is placed in a weak aqueous solution of some blue-green pigment. The gelatine absorbs the color in the same proportion as the silver has been reduced in the film. Conseqnently there is no absorption whatever in the highest lights, as most all the silver there is reduced, while in the clear shadows, where there has been little or no reduction, the color is absorbed and the shadows are then lightened up and the contrasts lessened in the prints.

This process with a slight modification can be made available for the improvement of weak or thin negatives, viz.:

Water - - - - - -	8 ounces.
Bichromate of Potassium - -	2 drachms.

The negative is placed in this solution for four or five minutes, and is then taken out and dried (in the dark). When thoroughly dry, it is placed film side down on a piece of black cloth or paper and exposed to the daylight from 10 to 15 minutes according to circumstances.

Here the transparent places or shadows are influenced in such manner that the gelatine becomes insoluble, while the half-tones become so only in proportion to their density, and the high lights are not acted upon. The negative is now to be well washed and placed in a solution of India ink and water. Such parts as are not affected, *i.e.*, where there was a somewhat heavy deposit of silver, absorb the inky solution, while the partly-illuminated tones absorb the tint proportionally, the deep shadows remaining as they were. When dry the pigment remains in the film as absorbed, and the intensification is a graduated one.

A general intensification of a negative can be accomplished by various methods. The mercurial intensifier, however, remains the most practical one for general purposes.

In cases where intensification is desirable, that will admit the smallest quantity of actinic rays, and where no penciling is contemplated, subjects as landscapes, architecture or interiors, an uranium intensifier has proved of greatest service. The advantages are that any existing fog in the negative is not aggravated, and then that it offers the possibility of reducing or of entirely re-

moving the intensification at will. The solution is made as follows:

A. Water - - - - 3½ ounces
Uranium nitrate - - - 15 grains

B. Water - - - - 3½ ounces
Red prussiate of potash - 15 grains

C. Glacial acetic acid.

For use, take A, 2 ounces; B, 2 ounces; C, 3 drachms.

As soon as the turbid mixture becomes clear, the dampened plate, which must have been well washed, is placed in the tray until the negative assumes an intense red-brown tone. It is then to be washed, only until the water ceases to run off in streaks. Prolonged washing reduces the intensification.

Partial intensification or reduction of a negative in many cases is practical, and an operation to be recommended. It is one which apparently is practiced by but few operators. The process is so easy and requires so little preparation that it can be characterized as a chemical *retouché*.

The plate to be operated upon must first be moistened, not saturated, with water; it must then be placed in a horizontal position on two carriers,—dry plate boxes will answer,—so that it will rest about three inches above the table, on which, beneath the plate, a piece of white card-board or a mirror is placed, so that the action of the solution may be observed, and the effect checked as soon as the desired point has been reached.

A basin and glass of clean water should be within reach, together with some camel-hair brushes, and the solutions in small wide-mouthed bottles. The latter should contain the usual bichloride solution for intensification, and several others with solutions of red prussiate of potash of various strengths, varying from 1:15 to a concentrated one; also one of hyposulphite of soda, 1:15.

When single portions are to be reduced, take a pencil, dip it in the weakest solution, and go carefully over the dense spot, at the same time take another pencil, dip it in the clear water, and go over the contour or edges of the place to be reduced, the process obviates sharp edges. If the weak solution does not act

energetically enough, try the next stronger, and so on, observing the same conditions.

As soon as the desired effect is reached, quickly place the negative in the dish of water. To overcome any sharply-defined contours, the water brush must be nsed. Should, however, sharp lines appear, they can be easily blended with a fine pencil, using a strong solution. To prevent the spreading of the reducing solution, the plate should be partly dry.

To intensify local portions of a negative, it is only necessary to apply to the spot the bi-chloride solution with a fine brush or pencil until the bleaching process has proceeded far enough. The plate is then laid in water for a short time, after which it is held over a bottle of strong ammonia, the fumes of which soon blacken the spot. Where larger surfaces are involved, a solution of sulphite of sodium may be used.

Where large surfaces are to be reduced, the potassium-ferric-oxalate reducer can be applied and blended with a brush and water.

Other methods for reduction can also be applied, as the shorter processes here given are subject to modification.

There is a word of caution, however, that is not to be forgotten, —that all chemicals enumerated in these formulæ are poisonous, and too great care cannot be taken in their use.

In conclusion, we will now treat of a condition that sometimes happens to an otherwise perfect negative, namely, the breaking of the glass.

Broken negatives are easily restored, provided the film is intact. All that is necessary is to lay the broken negative, film side down, on a sheet of glass and warm it, then pour some Canada balsam on the broken negative so that some of that medium will flow into the cracks. Have another sheet of glass warm and in readiness, of exact size of the broken one, flow this with balsam and quickly place it on top of the broken negative, and press well down, so that any excess will ooze out at the sides; now lift from the bottom support and set away to dry. If carefully done, the negative will be as good as ever.

THE CHANGES THAT PLATINUM PRINTS ARE LIABLE TO.*

By Chapman Jones, F.I.C., F.C.S.

IN January, 1887 (*Phot. News* xxxi, 39), I made a few experiments in connection with the alleged fading of platinum prints, and stated that as ordinarily prepared they were darkened and yellowed by exposure to sulphuretted hydrogen, and that though the original appearance of the print could not be restored by hydrochloric acid, chlorine water was effective for this purpose without injury to the colour or depth of the image. I mention this early reference to the matter because since that time the use chlorine water has been recommended more than once as if its use for this purpose were a new idea, and it might have been thought that I was following up the suggestions of others.

My attention was again forcibly directed to this subject in November last by the kindness of Mr. Ralph Robinson, who sent me an exceedingly fine example of the apparent fading of a platinum print. A few weeks after this in an article in *Photography* (vi, 818), I asked that anyone who had platinum prints that had apparently faded or were otherwise changed in appearance, would, if possible, favour me with them for experimental purposes, but to this appeal I received no reply. I conclude therefore that changed platinum prints are comparatively rare, and this agrees with my own experience and that of many others.

The questions that naturally need answering in this matter are—What is it that changes? How does it change? Can the original colour be restored? and, Is the real permanency of the print involved? I think I can answer these questions satisfactorily, and show that the platinum image is not affected, and that the original colour can be restored without injury to the photograph.

Mr. Robinson's print was produced by the usual procedure on the ordinary hot bath paper nine or ten years ago. To all appearance the image itself has changed to a yellowish brown, and on unmounting a part it is clear that the paper of the print

* Read before the Royal Photographic Society.

is discoloured right through. But the effect is not a mere staining of the paper,—the image itself is brown, while it was black. The print was mounted on a very common board, which has darkened considerably where not covered with the print, and the colour of the mount is so similar to that of the print that one might suspect the change in both to be due to a similar source, and I believe that this is so to a large extent.

The print was easily unmounted by soaking in cold water. It was obviously necessary to use *small* pieces for the various tests, but in every case the examination for each constituent was done more than once and generally by different methods. The print contains iron and gave evidence of the presence of very little sulphur—in combination of course. The mount appeared to contain more iron than the print; it certainly contained more sulphur, and some of this sulphur was in a form that allowed of its volatilization by boiling with hydrochloric acid. An aqueous extract of the mount decolourised potassium permanganate and iodide of starch solutions, with hydrochloric acid it appeared to go slightly turbid on standing, it became slightly turbid with mercurous nitrate, and with silver nitrate it soon became brown. These reactions point to the presence of sulphur compounds other than sulphates. Silver was tested for but not found.

These results indicate that the change of colour is probably due at least partly to iron compounds. I found that potassium acid oxalate in saturated solution had little effect even when the print was soaked in it for one hour. Hydrochloric acid was better, but was not effectual even when persevered with, and chlorine was perhaps a little better still, but even it did not fully restore the print. A mixture of dilute hydrochloric acid and chlorine water was quite successful; in a few minutes it entirely got rid of the brownish tint and gave a pure black image. The mount was partly bleached by hydrochloric acid, but chlorine water coloured it to a reddish tint.

Thus it appears that the change in the print is due at least partly to the iron it contains having been acted on by sulphur compounds, probably sulphuretted hydrogen, evolved from the common mounting board used. I find that platinum prints are

darkened by sulphuretted hydrogen, and that hydrochloric acid has only a little effect upon the darkened print, while a mixture of acid and chlorine restores the original colour. I made several experiments to see whether chlorine might be safely used for this purpose without the risk of losing anything from the detail or strength of the high lights. An old print showed no sign of being affected. A recent print was soaked for one hour, while ten minutes is more than sufficient to restore any print I have experimented with, but without the slightest apparent effect. A sepia print after one hour's treatment showed evidence in one part of being slightly affected but only in one small part, and so slightly that one could not say positively that there was any change at all Other prints were treated for three hours without obvious change.

I would recommend for the restoring of discoloured or apparently faded platinum prints, to soak them in hydrochloric acid mixed with about ten times its bulk of water, or more, and to which has been added a few drops of sodium hypochlorite solution, enough to give a distinct odour of chlorine and in daylight to show the colour of chlorine in the liquid. After five or ten minutes the print should be well washed and dried as usual.

We have often been told that if platinum prints change or discolour it is because they have not been thoroughly washed and that iron has been allowed to remain in them. Now it is common knowledge that iron stains are difficult to remove from paper or linen, and I find that it is practically impossible to get rid of the iron from platinum prints. After washed an unexposed piece of platinum paper for four hours in dilute hydrochloric acid (1–60), that is one hour after it ceased to be possible to detect the removal of iron from it, and finally washing it for one hour in distilled water, the paper still contained iron ; it was browned by sulphuretted hydrogen, and after browning was bleached by hydrochloric acid and chlorine but not by acid alone. A piece of paper coated with ferric oxalate only, after washing in dilute hydrochloric acid for four or five hours and then for one hour in distilled water, was found to contain iron. Nor does the chlorine treatment confer immunity from change by sulphuretted hydrogen,

for prints that have been browned by it and then bleached and washed are apparently as readily affected by it again as at first. Thus iron remains after prolonged washing in unexposed paper, and as might be expected there is rather more where the iron salt has been reduced by exposure. In three different prints I took equal areas of the dark shadows and of the lighter parts, and found more iron in the darker parts than in the lighter. The amounts of iron were small, but in order to make sure of this difference, I asked a person who knew nothing of the work to inspect each pair of reactions, and he confirmed my own observations. The iron being to a certain extent proportional to the depth of colour of the image would appear to account for, or at least to partly account for, the browning by sulphuretted hydrogen being more marked in the deeper shadows than in the lights, and the appearance of a change throughout the image.

Having found that iron is always present in platinum prints, I sought further proof that it is competent to produce the effects I have ascribed to it by treating paper coated with the iron salt alone. For this purpose I used some kindly furnished me by Mr. E. J. Humphrey of the Platinotype Company, and also some prepared by myself. In both cases after prolonged washing with acid iron remained, and the coloration by sulphuretted hydrogen was produced on the coated side of the paper as before. But if paper is coated with potassium platinous chloride alone, dried and washed, platinum compounds remain apparently fixed in the paper, and will brown with sulphuretted hydrogen, and may be bleached again with chlorine though not with hydrochloric acid. Platinum compounds may therefore occasionally have something to do with the changes produced.

In a certain sense it would be true to say that the image of a platinum print consists of metallic platinum and some iron compounds, but as the amount of iron is so small in properly-prepared prints, I think this statement, without qualification, would be deceptive. Still the iron is there and can be proved in many ways.

ACCIDENTS.

ACCIDENTS are of very frequent occurrence in a photographer's life. The ones that happen among his glass-ware and porcelain dishes in the dark room, and those that cause good negatives to crack in his fingers, and films to slide off their support and promptly slip down the waste pipe—he considers as being more or less in the day's work. Accidents to apparatus are less common, and therefore more annoying; but while such as happen in the studio can be more or less easily remedied, those that occur when the operator is far away from his workshop are more than annoying. They do not simply delay progress a short time, but sometimes prevent any satisfactory work from being done at all, in perhaps a district which has only been reached after a long and expensive journey. It does not need a catastrophe to produce such a result:—a split tripod leg, a loose screw in a focusing rack, a worn or torn piece of velvet in a rebate, or a pin-hole in the bellows, is all that is necessary to produce the most exasperating consequences.

The holiday season is fast approaching, and before long a large proportion of the readers of this article will no doubt be searching for pictures and "bits" in places far distant from their present abodes. We have even less doubt that several of them will meet with the identical mishaps to which we have referred above.

The first precaution to be adopted is that of prevention. This involves the complete overhauling of every piece of apparatus that will be taken away: leaks must be searched for, and if found, mended; dead-black must be applied to wood work where rubbed off; all screws looked at and tightened if necessary, or replaced by new ones; velvet linings in rebates at back of camera, or in dark slides, repaired or replaced if worn; diaphragms should be blacked if they have become bright—those of the iris form being especially looked after; lenses cleaned and the blacking inside the mounts touched up; shutters should be tried to see if they work properly, and taken to pieces and cleaned if they do not; focussing screens must be cleaned and oiled, and pencil

marks, showing centres, redrawn over the old lines ; finders, tripods, and even the camera case and straps must all be thoroughly overhauled and examined.

The next precaution to be adopted is to put together a few tools, etc., to take away, so as to have the means of effecting a cure in the case of a mishap.

We mentioned before a split tripod leg as a possible accident. The best temporary cure for this is to bind it up with copper wire, supplemented with one or two screws in bad cases. This means that we must take a pair of pliers, some wire, some screws, a screwdriver and a brad-awl ; an American tool pad will provide the most useful forms of these latter tools, and will also include several others that may come in handy. Then there is the possibility of having to repair a piece of velvet lining somewhere or other ; a few strips of velvet and a small bottle of cement will meet this emergency, and the same articles can be used for patching up holes in the camera bellows. Black sticking plaster is also a very easily applied remedy for the latter defects.

A very small file is sometimes almost indispensable ; a brass rack may receive an accidental knock, which turns over the edge of one of the teeth and prevents the pinion from passing along ; or, which is much worse, a screw which is intended to hold the rack down, becomes loose, works out a little way, and forms an absolute barrier to the pinion. We have known this to happen with a large and very heavy camera. The screw allowed the camera to be racked out to its fullest extension, and then rose up and completely barred the way for returning. The screw was in such a position that it could not be reached with any form of turnscrew, even if any one had had such a thing—pocket-knives were tried, considerably damaged, and then rejected as useless. There was only one file that could have been of any service, and that was a small, thin file ; with this the head of the screw could have been filed down to the notches of the rack, but of course there was not such a thing to be had. As a last resource force was tried, but the camera, rack and screw combined were too much for anybody, so, having exhausted all our resources, we comforted the owner of the camera as best we could and left him. Since

that day there has always been a small file in our luggage when on a photographic tour, and when we go any distance with a heavy camera with brass racks, that file will go too.

Shutters have a knack sometimes of going altogether wrong if exposed much to sea air; the more delicate moving parts become clogged with salt, the speed slows down very considerably, and occasionally the moving plate or blind will stop half-way in the middle of the exposure. We have known many instances of this, and the only effectual remedy is to take the shutter to pieces, clean it and put it together again. This is not easy, excepting when we are provided with a very small screwdriver and a pair of forceps to replace the smaller parts in their proper positions; and unless the mechanism of the shutter is well understood, such a task should not be attempted. We think, however, that photographers should make it a rule to become thoroughly acquainted with the construction of any appliance they may use; if more did so there would not be so many complaints about apparatus, which, in many cases, only becomes defective through improper use and lack of reasonable care, and not by reason of the bad workmanship of the maker.

The few tools we have mentioned above will in all probability be sufficient to meet any contingencies. They will occupy very little room in the luggage, and there will be ample compensation for the slight extra trouble involved in packing if anything occurs which renders it necessary to move them. On the other hand, if no accidents happen, and the tools are therefore not wanted, there is no reason why the photographer should grumble at his good fortune.—*Photo Notes.*

You are not responsible for consequences or results. Do right, and leave the consequences with him who is truth, and loves and guards his own. If we do evil that good may come, we take the matter out of his hands into our own. There is an uprightness of speech as well as of action that we should strive to attain. Love the truth, follow the truth, and practice truth in word, thought, and deed.—*John B. Gough.*

THE DAWN OF PHOTOGRAPHY.

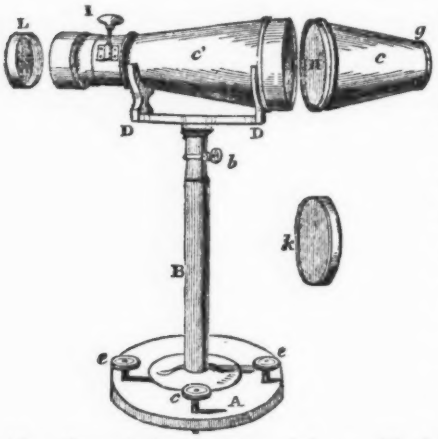
EARLY DAGUERREOTYPE DAYS.— IX.

BY JULIUS F. SACHSE.

(Continued from page 266.)

ONE or more of these new cameras, of different sizes, and fitted up with the Petzval lens, were forthwith sent to Philadelphia, and it was one of these instruments which we pictured in a former chapter, and which is here again reproduced for the benefit of such as have no access to our previous numbers.

This novel apparatus was designed exclusively for portraiture. It was made entirely of brass, so that variation of climate had no effect upon it: it was portable and occupied but little space. It became known as the "German" or "Voigtlander" Camera. The brass foot (A) is placed upon a table or other firm support, and the pillar (B) screwed into it. The body of the camera (CC) is laid in the double forked bearing (DD). The instrument is now properly adjusted by means of the set screws (*eee*) in the brass foot, or it may be raised, lowered, or moved from one side to the other by the telescope stand, and when correct fixed by the screw (*b*). The portrait to be delineated is viewed either through the small lens (*g*), or with the naked eye on the ground glass plate (H), the focus being adjusted by the screw (I).



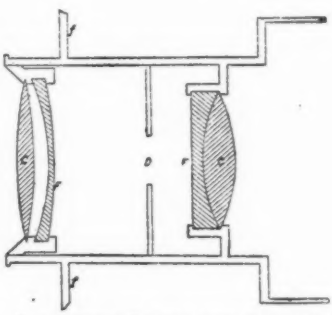
When the portrait to be taken was delineated on the ground glass to the satisfaction of the operator, the brass cap (C) was placed over the lens, and the entire body taken into the dark room, taking care not to disturb the position of the stand. The body was then detached at the part (H), and the prepared plate, inclosed in the brass frame (K), introduced into its place. The whole was then again placed in position on the pedestal before the sitter; the brass cap (L) was then

removed, by which the plate was exposed to the full influence of the light, after which the cap was again replaced.

The optical parts of these instruments are thus described by an American optician, shortly after they were placed on sale in this country: "The small size consists of two separate achromatic lenses; the first, or external one, has a free aperture of 1½ inches; the second, or internal, 1⅝ inches; and both have the same focus, viz., 5¾ inches.

"The larger size differs from the smaller. The inner lens is an achromatic 3¼ inches diameter, its focal length being 30 inches. The outer lens is a meniscus,—that is, bounded by a concave and convex spherical surface which meet — having a focal length of 18 inches.

"For a very distant view, the aperture in front is contracted by a diaphragm to ⅛ of an inch. By this means the light is reflected with considerable intensity, and the clearness and correctness of the pictures are truly surprising."



THE ORIGINAL PETZRAL LENS AS MADE BY VOIGTLANDER.

C C, Double convex crown glass lenses.
F F, Negative flint lenses; the front, plano-concave; the back, negative meniscus.
f f, Flange.
D, Diaphram.

The Langenheim brothers and Schreiber had become more or less expert in the manipulation of the novel apparatus first sent over. During this time, however, they still remained with the newspaper, which was gradually increasing in circulation.

However, when the consignment of improved outfits was received it was decided upon to sever their connection with journalism and open a professional daguerreotype studio, as the results were supposed to be far ahead of anything thus far attained in this country.

Another matter of note in connection with these improved Voigtlander cameras was that the camera and all the apparatus and materials for practicing the daguerreotype art, were packed in the same box, the whole taking up but little space, and were

FREDERICK LANGENHEIM, from a Daguerreotype taken in 1843.

the pioneer portable outfits, the idea being to use them if necessary on a journey or for scientific purposes as well as portraiture.

For the latter purpose a room was rented in the third story of the Philadelphia Merchants' Exchange, at Third, Dock and Walnut Streets, at that time one of the finest buildings in the city.

The promoters of the new enterprise, who by this time had learned the use of bromine, soon found that in at least one feature, that of the camera, American ingenuity was ahead of German skill, and the novel German camera, with its mathematical exactness, was soon discarded for the square wooden American model, to which they fitted the Voigtlander lens, thereby producing an apparatus capable of producing the finest optical results.

Thus modified the venture proved successful from the start, and by virtue of the excellence of their miniatures they soon enjoyed a large share of respectable patronage.

It is a matter of note that shortly after the Langenheims and Schreiber severed their connection with the *Alte und Neue Welt*, the publication of the periodical ceased.

By virtue of their German connections, the Langenheims foresaw a business opportunity whereby both they, as well as their foreign connections, would be benefited, by establishing an agency here for the sale of the Voigtlander objectives, which were then superior to any other lenses in the world, together with a general stock of daguerreotype supplies.

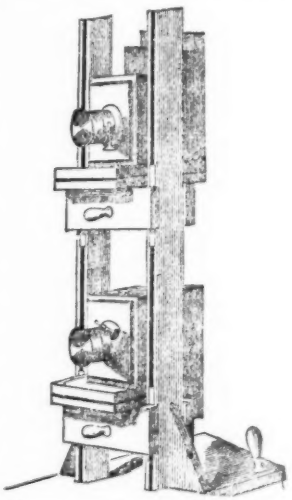
For this purpose William Langenheim went to Europe in the fall of 1842, and completed arrangements which gave them the agency for the Voigtlander products in America.

An additional room was now secured in the Exchange for the new enterprise, and one of the first results was the *Ledger* advertisements mentioned at the opening of this paper. The exact date when the Daguerreotype rooms were opened in the Philadelphia Exchange is not known to a certainty, except that it was prior to July, 1842. This date is settled by a well-authenticated and dated full length picture of a child.

It may seem curious at the present day, but prior to the time of the advent of the Petzval lens, Daguerrean portraiture had been confined to bust pictures, as it was not found practicable with

the lenses then in use to attempt a full-length portrait. The Langenheims were the first to make successfully a full-length portrait that was of equal definition without distortion.

Of the many attempts to obtain a full-length portrait by the heliographic process, and for the purpose of showing to what straits the ingenious operator of half a century ago was put, the following specimen is selected, as it was thought to have solved the problem. It was the invention of a Mr. Woodbridge, of New York, and consisted of a double camera, two boxes, placed in a frame one above the other, and so arranged as to slide easily up and down.



WOODBRIDGE FULL LENGTH CAMERA.

The method of using this novel apparatus was as follows: The subject was first placed in position, then both cameras were focused by means of the lens adjustment; one on the upper part of the body, the other on the lower portion. This difficult part of the process it is said was accomplished by means of a mirror. When all was ready the plate was placed in the upper box, and exposed; when completed, the slide was closed and the plate and holder removed to the lower box, and an exposure made on the lower portion of the figure. It is stated that the adjustment of the instrument was so complete that a perfect union of the parts was effected in the picture without the least possible line of demarkation being visible.

The size of plate which it was designed to use in this duplex camera, was 10x13 inches. This cumbersome and uncertain apparatus was soon superseded by the regular American studio outfit, equipped with the Petzval lens. The present writer, after a long and diligent search, has failed to discover any specimen portrait made by the Woodbridge apparatus.

(To be continued.)

TESTING PLATES FOR COLOR SENSITIVENESS.

THE writer is not aware that any definite and easy plan has been propounded for testing plates for color sensitiveness, that is, as to the way in which they will render color in proper luminosities. This is practically the subject which he brought under the notice of the Royal Photographic Society at its recent meeting, when he endeavored to give a method available for everyone, and which was quite independent of any reference to the spectrum. Of course, the foundation of it must be based on spectrum sensitiveness of the surface to be tried.

It will be our business in this article to try and explain briefly the plan recommended. There is, no doubt, a great deal of looseness of talk as to color sensitiveness, and much that is vague, and it seems desirable, at all events, to try and formulate some plan which will tell one when a plate is practically equally sensitive to all colors when exposed behind certain screens, and to try and find what kind of screen is most suitable for any particular kind of plate. Suppose we have five small squares of different colored glasses placed side by side in a row, and covering five apertures cut in a black mask, and place this in contact with a sensitive plate, it is evident that an exposure to white light will cause the images of these squares to develop with very different degrees of density. What we seek in color sensitiveness is that the density should be a function of the brightness of the light passing through the different colored glasses without any regard to the color *qua* color. We can measure the transparency of these color glasses in a very ready manner by the plan which the writer has described in several journals, using a transparent screen, or by the ordinary Runford method of using two lights and interposing between one of them the colored glass whose transmissive power is to be measured. By rapidly altering the comparison light to make the shadow illuminated with lamp light alone, too dark, and then too light, and gradually diminishing the distance the light moves through, a very

close approximation of the transmitted brightness compared with that when the glass is removed can be arrived at. Thus if the naked movable light, in the case of a certain glass, had to be placed at sixteen inches distant from the screen, and with the naked light sixty-four inches, to make the shadows cast equally bright, we should know that the light transmitted through the glass was only one-sixteenth of the naked light.

All the glasses used in the row should be thus measured, and a good selection of color to make is stained red, orange, lemon yellow, bottle green, cobalt blue, and white. As a matter of fact, the first, fourth, and fifth are sufficient, but to make matters more certain the second and third are added. The first, fourth, and fifth are sufficient, because these three practically divide the spectrum into three portions. But as, in all isochromatic plates, there is a want of sensitiveness at a place near the yellow-green, the orange and yellow are added to the list. Having measured the transparency of the glasses, if we can make the opacities of such a depth that in a print they represent these different brightnesses of transmitted light, we shall have formed a surface which is practically equally color sensitive. Now, it may be asked, is it fair to use glasses instead of spectrum colors? A little logical reasoning will show that it is. If we used pure spectrum colors, what we should have to do would be to find some screen which would cut off some rays to such a degree that the print from the resulting negative would give the luminosity of the spectrum itself; or, if we used a bit of the spectrum, and combined the rays to form a color, we should have to cut off rays from the white light and from the colored light, so that the luminosities of each were represented by the opacities. When we use colored glasses this is exactly what we do. It is not sufficient to take one portion of the spectrum alone, however; we must take several, and, if possible, overlapping portions, and endeavor to attain the same end. These glasses give overlapping portions, and therefore represent our desideratum. It may, therefore, be concluded that if we use colored glasses, and can get a negative which, when printed, will indicate the relative brightness of the light transmitted, we have accomplished what we require. By measuring

the densities and discovering the transmitting power of the different glasses, the writer arrived at a knowledge of what was and what was not required. But the method was too complicated to be followed out by everyone, particularly if they had no measuring apparatus always at hand. To get over this difficulty a modified plan was adopted, based on reasoning of the very simplest kind. Suppose the light transmitted through the different glasses could by any means be made equal in brightness, "then if the opacities of the portions of the plate beneath the different glasses were equal, the plate would be equally sensitive to all colors." Now there were two obvious plans for securing this. Suppose that the brightnesses of the light transmitted were white one hundred, yellow eighty, orange sixty, green forty, red twenty, and blue ten, it is manifest that the red would have to be reduced in brightness by half, the green by three-quarters, the orange by five-sixths, the yellow by seven-eighths, and the white by nine-tenths. (Of course, these are only fancy numbers.) If now we took a cardboard disc and cut out different segments each the breadth of the square of glass, we could rotate such a disc in front of the row of colored glasses, and obtain the necessary diminution of brightness. Thus in front of the blue there might be none of the disc rotating, in front of the red a segment of 180° cut away, and the annulus left might be made to rotate in front of the red glass; 270° cut away from the next annulus rotating in front of the green glass would reduce its lightness as required, and so on for the remainder. Various screens in front of the light could be used, and eventually one would be found which, if the plate were at all manageable and sensitive in some degree to the red, would give the needed equal opacities when the plate was developed. Instead of this rotating disc, the brightness might be reduced by placing behind the glasses small squares cut out of plates, exposed in a sensitometer, which have the required opacities to reduce the brightness of the transmitted lights. (In such a case, the opacities of the deposits should be measured by the plan which the writer has advocated, or equal brightness of transmitted light will not be obtained.) Whichever method of reducing the brightnesses be adopted, we now have a

plan which enables the effects of different screens to be very readily seen. For instance, with an orange screen in front of the light it was found that the blue and red, with a Lumière plate sensitive to yellow and red, gave greater opacity than the white and yellow, which had equal, and the green had less. It was evident that to cause equality the screen used must increase the proportion of the green available, and diminish that of the red and blue. A solution of naphthol green was placed in front of the orange glass, through which the light was admitted to the color sensitometer, and eventually a depth of green was found in which all the squares beneath the colored glasses showed the same opacities. For the particular brand of plate in question the color screen to be used to make all colors perfect in a print had evidently been found. Now although the luminosities had been measured by lamp-light, and the exposures made by the same, yet a further consideration will show that in daylight exactly the same equality of color sensitiveness must obtain. This was proved experimentally in a way it is not necessary to describe now. With plates only sensitive as far as the yellow, of course the part beneath the red square must always show a lack o exposure, and equality can only be hoped for in the white, yellow, blue, orange, and green.

Following on this it may be said that for a Lumière plate sensitive to red and yellow, if a combination of screens be made with light chrominium green and orange, the color sensitiveness will not be materially different from that obtained by the combination between the orange and the naphthol green. Viewing the spectrum through either of these combinations it is curious to see that only the most luminous part of the spectrum is transmitted, and if a plate be exposed to a spectrum when this combination has been placed in front of the slit it will be found that the general form of the spectrum luminosity is very fairly represented by the opacities.

This method has been placed before our readers with a hope that it may prove useful to them in gauging the suitability of a plate for the purpose of the reproduction of paintings, when it is desired to have in black and white the luminosities correctly rendered.—*W. de W. A., in Photography.*

THE PHYSICS AND CHEMISTRY OF DEVELOPMENT.

II.

BY THOMAS BOLAS, F.I.C., F.C.S.

(Continued from page 251).

NOW we come to another class of decomposition which you may call thermolysis; and thermolysis, or separation by the action of heat, seems to have a closer analogy to decomposition of light than ordinary electrolysis has. Here is a compound of mercury and oxygen, red oxide of mercury. This particular compound may be formed, and was formed by Priestley, by the direct combination of mercury and oxygen. At about the boiling point of mercury, mercury and oxygen will combine and form this red powder; but if you heat it a little more strongly it is decomposed by the action of heat, and gives an excellent example of thermolysis or decomposition by the action of heat. In the case of thermolysis there seems to be a constant strain, first towards what chemists call dissociation, and then comes a more definite decomposition. A great many substances can be decomposed by the action of heat, water among them. If you take small platinum balls, and heat them almost to the melting point and then dip them into water, at each dip a small quantity of the water will be thermolysed, and bubbles of oxygen and hydrogen will be liberated Again if you pass electric sparks through steam, a portion of the steam is thermolysed, and you get steam passing over which contains mixed in it just a little free oxygen and hydrogen. This brick red powder, red oxide of mercury, is interesting historically as being the substance from which Dr. Priestley first obtained oxygen; and Dr. Priestley's discovery of oxygen was one of the most fundamental steps in the growth of modern chemistry.

Now, I want to suggest to you, and to impress upon you, that the key to a just knowledge of the chemical action of light, and how light acts upon a photographic plate, is to be found in the Clerk Maxwell view of light, a view which for a long time has been almost dormant and has not entered into the general run of

scientific discussions outside mathematical circles. Clerk Maxwell's view of light only appealed to a very few persons indeed, and was consequently almost a dead letter until within the last few years Dr. Oliver Lodge in this country, and Professor Hertz in Germany, have by their expeimental researches almost—or quite—demonstrated the truth of the Clerk Maxwell view of light. According to the Clerk Maxwell view of light, light is a function of very rapid alternations of electricity; that is to say, light is not an incident of a constant current, but it is an incident of alternations of electricity, or of something analogous to an alternating current in which the alternations are much more rapid than we can produce, or at any rate by mechanical means; and that light is a radiant side of electricity, and is that side of electricity which manifests itself in the non-conductor when there are rapid alternations in the discharge. This statement of the Clerk Maxwell view of light is a little crude, but all first statements have to be a little crude, and you must get less crude notions gradually and by personal study.

Connected with the Wimshurst machine are two Leyden jars, and when the machine is put in action we produce an electric current which charges the jars; the jars become charged by the constant current generated from the machine, and every now and then the charge of these jars becomes so strained that it breaks through the air, and we get what is called the discharge of the Leyden jar. Now, the Leyden jar discharge has long been upon record as one of the most instantaneous phenomena known, and the light of the discharge of the Leyden jar has long been used when we have wanted the most instantaneous photography. You probably remember how Professor Mach, of Prague, photographed flying bullets by the flash of the Leyden jar; that is to say, it is instantaneous enough to give a sharp picture of a flying rifle bullet, and quite early in the history of photography Fox Talbot proposed* it as a means of getting instantaneous photographs of rapidly moving objects. Now, in spite of this extreme rapidity it is now known—thanks largely to the researches of Professor Lodge—that the discharge of the Leyden jar is not a single

* *English Patent Specification*, No. 13,664, of the year 1851.

phenomenon, but is a series of discharges first in one direction and then in the other. The *dielectric* of the Leyden jar is in a condition of tension, it overruns like a spring, and instead of the discharge of the Leyden jar being a single spark, it is as a matter of fact a very great number of discharges passing in contrary directions. Now, when the jar discharges we have in the surrounding non-conductor a series of waves or oscillations which Hertz has shown to be actual light, but light of such a wave length that the eye will not recognize it as light. Hertz and Lodge have shown all this, experimentally. Clerk Maxwell demonstrated mathematically many years ago that light must be the radiant side of electric discharge. He recognized that light, whether of the long wave length and invisible to us, or the short wave lengths of light which our retinas recognize, can only be propagated in a *di-electric;* hence he showed that every non-conductor must be transparent, and every transparent substance must be a non-conductor of electricity. If it is infinitely transparent it must offer infinite resistance, and if you have any substance perfectly and absolutely opaque, that must be a perfect conductor of electricity. Every transparent substance is a non-conductor, every opaque substance is a conductor; indeed according to Clerk Maxwell's mathematical doctrine, to say a substance is a conductor is equivalent to saying that it is opaque, just as to say that a quantity is twice two, is another way of stating that it is four. We must, not however, be led astray by appearances. Here is a piece of chalk, which is really a transparent substance; although its state of aggregation might make a casual observer regard it as opaque; chalk is not only a non-conductor, it is a transparent substance; look at it in the form of Iceland spar. When Clerk Maxwell says that all transparent substances are non-conductors, do not be led astray by the fact that an electric current passed through that acidulated water,—that is a case of electrolysis, not conduction. Now, perhaps some apparent exceptions may occur to you. For example, ebonite, though it looks opaque, is really a transparent but highly colored substance. Captain Abney, I believe, has photographed through it. You probably are aware that carbon may exist in a black and

opaque form, and it may also occur as diamond; the transparent diamond is a non-conductor, the opaque graphitoidal carbon is a conductor. But you are told in the text-books that diamond and ordinary black carbon are the same substance; they are only the same substance in a partial sense, they are allotropic forms of the same element; graphite and the diamond are physically and chemically perfectly distinct elements, although capable of being converted into each other.

Now I am going to show you, if I can, some experiments on electrical radiations; and I propose to content myself to-night with showing you one of Hertz's first experiments in a slightly different form, and next week, if possible, I should like to show you that the electrical radiations in the di-electric can be reflected and refracted like light. Hertz has shown that the electrical radiations which are produced in the di-electric, when there is an alternating discharge, travel at the same speed as light, they can be refracted like light, they can be polarised like light.

For a simple experiment, here are two plates of copper: these are connected with the terminals of a small induction coil, and I attach bright polished silver balls to them, so that we can get a sharp, snapping discharge in between them. Every one of these discharges is really a multiple discharge, a series of discharges and back discharges. Now, supposing we hold over these plates two pieces of metal which will correspond to these particular electrical oscillations, we shall get an eleectric spark between them.

This long wave light, or light of any kind, falling upon any pair of conducting bodies which will respond to the particular oscillations, will produce an alternating electric discharge; and according to Hertz, light actually produces in the molecules an alternating electric discharge. These two pieces of metal are two pieces of metal which are sufficiently syntonic with the source of the radiations to give a spark. Now between the radiator and receiver I am going to put in this "transparent" sheet of ebonite, and you will see it allows this particular light to pass and the sparks are unaffected. Next I will interpose a picee of paraffin wax and with like result. Now see the instantaneous way in

which the spark is discontinued by the interposition of an opaque metal tea-tray. Such Leyden jars as we have here give oscillations of great wave length, perhaps thirty or forty feet; whereas to produce such light as would be sensible to the retina we should require to bring down the wave length to about one twenty-five millionth of an inch; and to do that we should want to make the jars smaller and smaller, until in order to get the radiations of such wave length as to affect the retina we should want to make the jars of something like atomic size. The subject of the Lodge-Hertz work has a very wide photographic interest. As Lodge points out the problem of producing light economically probably depends upon finding some means of producing electrical oscillations of the right wave length directly in the ether and without the aid of an incandescing substance, and there is reason to hope that that may be done. In the ordinary way of producing light we take a solid substance, and by some agency make it hot. For instance, here is a small dynamo and a small exhausted bulb, containing a filament of carbon. When the current passes the molecules of carbon are heated to a high temperature, and as a remote incident to an enormous consumption of force we have produced these oscillations of the ether, which are of the nature of that light which we see. Really such a process is enormously wasteful, and probably two hundred thousand times as much force is exerted as is required for the production of that particular light ordinarily required industrially; and when the great revolution in light producing comes—and it is tolerably sure to come—we shall produce our light with perhaps a two hundreth thousandth part of the energy that we expend at the present time. Professor Lodge, in his book on *Modern Views of Electricity*—a book which is on the table, side by side, with his little book on the work of Hertz*—says that when we produce light in this barbarous fashion it is as though in order to sound some little shrill octave of pipes in an organ we were obliged to depress every key and every pedal and blow a hurricane. That

* *Modern Views of Electricity.* By Oliver J. Lodge; London, 1889, Macmillan and Co. *The Work of Hertz and Some of His Successors.* By Oliver J. Lodge; London 1894, The Electrician Printing and Publishing Company.

appears to be the case, and quite recently Professor Ebert has in an experimental way at any rate produced light by a method which is approximately two hundred thousand times more economical than the ordinary method of producing the incandescent light by means of an electric current. Professor Lodge mentions a big steam-driven installation, and compares it with the time to come when we may be able to produce as much light by the energy of a small boy turning a handle. By receiving electric oscillations upon a surface of phosphorescent sulphite of calcium, these oscillations have been converted into oscillations of a shorter wave-length, and in some such method as this we may perhaps hope to produce the light of the future. Now, if a bright light such as that from our little dynamo is brought near to this phosphorescent sulphite of calcium, the light will be absorbed and gradually given out again; and instead of absorbing visible light it is possible to thus absorb the Hertzian rays, and they will be given out again as visible light. I cannot get through the whole of my subject to-night, otherwise I should explain to you not only how alternating electrical currents set up by light may bring about the separation of the constituents of silver salts, in the photographic film, and how, once silver is separated, this metal with the developer on the one hand, and the remaining haloid on the other hand, may form an electric battery which will set up a new action at the expense of the developer, and I take it according to this view you may get any amount of image from ever such a small initial reduction. And moreover, Mr. Oliver Lodge's view of the action of the eye—which is a remarkably interesting one, and published in his latest little book on the work of Hertz—gives, it appears to me, a real clue to a physical action as well as a chemical action in the sensitive plate. But I must leave those subjects over till next week, as I would like in conclusion to suggest to you that by a study of electrolysis by alternating currents, and by a study of the Hertz-Lodge experiments, a way may be opened towards a complete revolution in our notions with regard to photo-chemical actions. And moreover we are pretty evidently on the brink of a revolution in the means of producing light; indeed the time does not seem very

far distant when the amount of light required for taking an ordinary portrait may be produced by the expenditure of something like the force of energy exerted when one spins a teetotum.

(*To be continued.*)

MYSTERIOUS FAILURES.

UNDER this heading what a multiplicity of aggravating crosses present themselves to the notice of photographers of all ranks and classes. The best and most careful workers can never congratulate themselves on perfect exemption from some of those trials that combine to make up the daily lot of the go-as-you-please experimentalist, who by the way usually treats them in a reckless light-hearted fashion, and either dodges or ignores them completely; but they are still there, and the man who wants to become a successful photographer has to fight each one as it crops up, and if he cannot conquer, at least understand the reason for its existence. Some of those reasons are, to put it mildly, obscure, inasmuch as the difficulty may have been created for him, and with a perfect trust in the platemaker he has no suspicion that the cause of his trouble lies in the plate itself. This is certainly not a frequent occurrence, still it does sometimes happen, and possibly because it is so uncommon it is all the more difficult to combat. Once the fact is established, however, the trouble is very easily gotten over.

Not so with some others of more general acquaintance. How many a plaintive tale remains to be told of distraction consequent upon defective light in the dark room, or, perhaps, a marvellously well-hidden leak in the camera bellows or the dark slides. The dark-room window, or lamp, as the case may be, has been the means of depositing many a ton of plates on the dust heap, and it is quite possible, in fact highly probable, that in quite a large number of developing-rooms it is working in the same direction still. For some unaccountable reason this element of mischief is generally among the last to be viewed with suspicion, whereas

the general question of the safe lighting, either by lamp or daylight, of this particular corner of the premises should be one of the first subjects of thorough scrutiny.

Then again, as to shutters. It is not always the novice at photographic work who buys something new in the shape of a shutter, and is plunged thereby into the direst grief, because he takes it for granted that it is turned out by the maker as a perfect instrument. There is no need to particularize, but there are few workers, especially with hand cameras, who have not had provocation for a free denunciation of makers of eminence, whose success in every other direction has been marred by the careless adoption of a plan of shutter that leaked light freely all the time the operator waited patiently with his finger on the trigger for some coveted combination.

To find the "fault," whatever or wherever it may be, is not a very difficult matter when once suspicion has been dlrected to the most likely place to look for it; and to remedy it when found is generally speaking even still more simple. Why there should be any mystification as to the cause of fogged plates, for instance, is not altogether easy of explanation. Yet the fact remains that there is frequently a great deal, and that the actual source of the mischief is in the least suspected direction. Quite recently one of the most enthusiastic hand-camera workers in a neighboring colony was afflicted with occasional bad cases of fogged plates, the general average being about three out of each dozen exposed. In such case there was certainly no ground for suspecting the plates themselves, the dark slides were all amply protected when drawn and in use; the lamp in the developing was beyond suspicion, and the plates were all developed under similar conditions, and with newly mixed and fresh developer for each plate. At the end of a fortnight's worry in different and many directions, accident revealed the real source of the mystery; held at a certain angle with the sun's rays the leaves of the shutter allowed sufficient light to pass to flood the plate with the white light when it was ready for use. It was a defective shutter, and the only remedy was to fit another of an entirely different pattern in its place. Even this little item of actual experience may have its

TENIERS' "ALCHEMIST."
ORIGINAL IN ROYAL GALLERY AT DRESDEN.

NEGATIVE FROM ORIGINAL.

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...terious and seemingly unsolvable difficulty about getting uniformly
...perfect negatives, the great desideratum of all photographers.
...should be some consolation to anybody in a difficulty of any
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...nation and the exercise of some forethought and common sense.

CORROSION OF ALUMINIUM.

IN order to ascertain the effects of the weather upon ordinary sheet aluminium, Professor A. Liversidge has had two shallow dishes made of 1-23th inch gauge metal, of the best commercial quality, and exposed on the roof of the laboratory, University of Sydney, from November 23d, 1893, to December 7th, 1894, or one year. The metal was made into basins so as to catch the water, and to give the salts, etc., which it might hold in solution an opportunity to act upon the metal. The metal soon lost its brilliancy and became somewhat rough and speckled with dull grey patches. It also became rough to the feel, the grey patches could be seen to distinctly project above the surface, and under the microscope they presented a blistered appearance. The discoloration is held tenaciously, and does not wash off, neither is it removed on rubbing with a cloth. The raised parts are considered to be the formation of a hydrated oxide. Contrary to expectation, the cups had not lost weight, but had even increased, the one weighing 12.91 grms. had increased by 0.104 grm., and the other weighing 13.865 grms. increased by 0.080 grm. After soaking in water for some hours and rubbing, the first still showed an increase of 0.72 grm., and the second of 0.055 grm. To test the effects of common salt, a plate of the same metal, six by four inches, and weighing 19.820 grms., was repeatedly soaked in a solution of sodium chloride, and allowed to dry for months; this lost 0.019 grm., and after washing and rubbing 0.0165 grm. One reason for making these experiments

value for some poor sufferer who is now contending with a mysterious and seemingly unsolvable difficulty about getting uniformly perfect negatives, the great desideratum of all photographers. It should be some consolation to anybody in a difficulty of any kind for which there is no easy method of accounting, to at once grasp the fact that there is no hitch, however apparently mysterious it may be, that is not to be vanquished by patient determination and the exercise of some forethought and common sense.

—*Ex.*

CORROSION OF ALUMINIUM.

IN order to ascertain the effects of the weather upon ordinary sheet aluminium, Professor A. Liversidge has had two shallow dishes made of 1-25th inch gauge metal, of the best commercial quality, and exposed on the roof of the laboratory, University of Sydney, from November 23d, 1893, to December 7th, 1894, or fifty-four weeks. The metal was made into basins so as to catch rain water, and to give the salts, etc., which it might hold in solution, an opportunity to act upon the metal. The metal soon lost its brilliancy and became somewhat rough and speckled with large light grey patches; it also became rough to the feel, the grey parts could be seen to distinctly project above the surface, and under the microscope they presented a blistered appearance. This incrustation is held tenaciously, and does not wash off, neither is it removed on rubbing with a cloth. The raised parts are considered due to the formation of a hydrated oxide. Contrary to expectations, the cups had not lost weight, but had even increased, One weighing 13.91 grms. had increased by 0.104 grm., and the other, weighing 13.865 grms., increased by 0.080 grm. After boiling in water for some hours, and rubbing, the first still showed an increase of 0.77 grm., and the second of 0.055 grm. To ascertain the effects of common salt, a plate of the same metal. three by four inches, and weighing 19.829 grms., was repeatedly dipped in a solution of sodium chloride, and allowed to dry for three months; this lost 0.019 grm., and after washing and rubbing dry, 0.59 grm. One reason for making these experiments

is, that Mr. H. C. Russell, F. R. S., the Government Astronomer, some years ago tried aluminium cups for a rain gauge, but found that they were so quickly corroded through that he had to relinquish the use of the metal (if they had been gilt they might, however, have answered well enough). It is a very common thing to see aluminium recommended on account of its lightness, and its assumed permanent lustre; this assumption being due to the statements, repeated from book to book, that aluminium is unaltered by exposure to the air, to the action of water, hydrogen sulphide, and only slightly by dilute acids. The absolutely pure metal may be permanent in the air, but the best aluminium ordinarily attainable is, in this respect (in Professor Liversidge's opinion), little, if at all, superior to zinc. The commercial metal does not retain its lustre, but very rapidly acquires the appearance of old zinc. Recently it has also been found that aluminium is acted upon by sea water. Hence the claim, often advanced, that aluminium is a metal resembling gold or silver in the property of not oxidising, rests upon the very slenderest foundation.—*The Optician.*

PHOTOGRAPHY AS AN INSTANTANEOUS RECORDER.

THE fifth and concluding lecture introductory to the proposed Special Exhibition of Photography was delivered at the Imperial Institute by Mr. L. Clark. After drawing attention to the impossibility of dealing with each branch of such a large subject as "instantaneous" photography within the short time at his disposal, the lecturer defined the requirements of an imaginary "perfect" recorder, which must be able to make record of infinitely great and infinitely little. He dealt with the methods of producing instantaneous photographs, by the well-known means of camera shutters, and also by momentarily illuminating the object to be photographed. Captain Abney's research in regard to measurement of the speed of shutters was noticed. Where very rapid exposures of more than the 1-200th of a second were re-

quired, recourse had to be made to the electric spark, by means of which it was possible to give an exposure as small as the 1-200,000th of a second. This time bore the same relationship to one second as one second bore to four months. The researches of Lord Rayleigh on bursting soap bubbles were illustrated by photographs taken by the electric spark, and prepared as lantern slides. The bubbles had occupied about the 1-300th to 1-400th of a second in bursting. His experiments with jets and drops were described and illustrated. Photographs of Professor V. Boy's flying bullets, with an initial velocity of about 2000 feet per second, were exhibited and criticised.

Electric discharges on a photographic plate were referred to; and a slide showing similar markings on the arm of a boy struck by lightning was thrown upon the screen. Among other slides shown were several giving the records of lightning flashes, hail-storms, various other meteorological phenomena, and clouds, taken by polarised light. In dealing with the recording of high temperature, the lecturer showed slides illustrating Professor Robert Austen's experiments and records made of the melting points of the most refractory metals. The very interesting methods of obtaining the longitude by photographic means, and photographic instruments for surveying, were next referred to. The results obtained by the tele-photographic lens of Dallmeyer and numerous photographs taken from balloons and from kites were shown, together with photographs of interesting crystals, a curious set of photographs of the bacillus of anthrax by Marshall Ward, and peculiar effects of interference, by W. B. Croft. Photography as a means of identifying criminals was then considered. A fine series of military photographs, showing the explosion of land and submarine mines, followed; special interest attaching to the last photograph of H. M. S. Victoria, which was taken as the vessel was in the act of sinking. A miscellaneous series showing photographs of animals, and illustrating the well-known paradox, why the top of a wheel moves faster than the bottom, was terminated by examples of some of the earliest "instantaneous" photographs ever taken.

ON THE ROAD.

"GOOD morning, sir; I am the representative of Messrs. Hypo and Fixem," said a young man who was faultlessly attired (and who was evidently out on his first trip), to a Pennsylvania country photographer, as he handed him a beautiful little visiting card.

"Howdy do, sir," said the artist, "and how long have you been their representative?"

"Nearly six weeks," replied the drummer. "I thought I would call on you and sh—"

"I suppose he pays you a good salary?" said the dealer.

"Oh, yes," replied the young man, "you know I would not work for small wages. I wish you would l—"

"That's good," said the camera pusher, "you deserve it. I knew you were a born salesman as soon as you came in."

"Thank you, sir," replied the young man; "and now if you will let me sh—"

"If I were you I would stick by such a house," remarked the photographer.

"I will," replied the drummer, as he put his satchel on the counter the third time. "I have the finest l—"

"Don't you find things rough on the road?" said the artist.

"Oh, yes, sometimes I do," replied the drummer. "Now if I can sh—"

"You want to be awful careful how you associate with these drummers," said the plate-fixer.

"I am," replied our young friend, "I don't associate with them. I would like to sh—"

"How do you like Pennsylvania?" said the photographic artist.

"Oh, pretty well," he replied. "Can't I sh—"

"Well, we have a good State," said the former.

"Yes; but I want to show you my—"

"Business good?" broke in the imperturbable tin-typer.

"Yes, sir; but I want to show you my samples, and give you a demonstration of Hypo and Fixem's new anti-halation printing-out paper," burst out the now exasperated young man.

"Oh," replied the background adjuster, "why in thunder didn't you say so? I thought you just came in for a visit."

We don't know whether our young friend succeeded or not, as we were forced to leave, but about an hour later he was seen making his way, grip-sack in hand, toward the railroad station, with a look upon his face that savored more of sadness than pleasure.

Modern Criticism.—Sir John Millais objected to a criticism in the *Sketch* of his painting of St. Stephen, exhibited at this year's Academy, in which the writer said that the picture "makes one irreverently wonder why the martyr is represented with his clothes on, when we have authority for knowing that during the stoning Saul held his clothes. It is not pretended the executioners carefully dressed him after leaving him for dead." Sir John called the critic's attention to Acts vii, 58, where it says, "the witnesses laid down their clothes at a young man's feet whose name was Saul." There has been a good deal of talk about this picture, and it is only occasionally that the artist can get back on the critics as he did on the *Sketch* man. It must have been a comfort to him. This is the picture of which George Moore, the novelist, said: "If St. Stephen were signed by any other name he could praise it." That it is not up to Millais's other work there can be little doubt.

The Earthquake in Italy.—From Florence it is reported that the dome of the Cathedral has been cracked in two places, as a result of the recent severe earthquakes. The cracks run up into the frescoes, the facade is cracked, and one of the beautiful spiral pillars in three pieces. At St. Marco, writes a correspondent, a wall on which one of Fra Bartolommeo's paintings was hung fell in; some of the cells are injured, among them the oratory of Savonarola. * * * Some vases and statues in the Uffizi are broken. As for S. Croce, it is a fearful wreck. Altogether the artistic damage resulting from the earthquakes has been considerable.

The Editorial Dropshutter.

Our Illustrations.—German studio portraiture, a specimen from Hoffert's galleries at Dresden, Germany. This artist has a well-deserved reputation for artistic posing, and the specimen here presented is well worth studying by our local artists.

"The Alchemist." As an extra illustration for the current month, we present a copy of Teniers' Alchemist, one of the celebrated paintings in the Royal Dresden Gallery. David Teniers the younger, born 1610, died 1694, ranks among the most celebrated exponents of the old Flemish School. His compositions are noted for the fidelity to the original, and the minute correctness of both detail and accessories.

The importance of steady and useful employment, especially by the young, can hardly be over-estimated. The unemployed are generally the most unhappy and the most liable to wrong-doing. The person that is busy will have less time or inclination to find fault with others or to engage in disreputable affairs. Keep employed. Do something useful. Work for small wages if you cannot get more. Or work without pay rather than be idle. Such a person will not long lack employment, neither will he work long without fair compensation.

The Photographic Society of Japan.—The annual meeting of the above mentioned Society was held at the Koyokwan, Shiba, Tokyo, on Friday, May 17th, at 4 p.m., Mr. C. D. West, M.A., Vice-president of the Society, in the chair.

There was a good exhibition of photographs by members of the Society, particularly notable being those from the Genrokukwan, and from Mr. Otis A. Poole. There was also a technical exhibition in which several pieces of interesting apparatus were shown.

The following gentlemen were unanimously elected members of the Society:

Mr. Edwin Dun, Minister of the United States of America, Mr. Y. Egi, Mr Walter Elkan and Mr. C. Oyama.

The officers for the past year having resigned, it was duly proposed and seconded that they all be re-elected, and the proposal was carried unanimously.

It was duly proposed and seconded and carried unanimously, that Mr. Edwin Dun, Minister of the United States of America, and the Hon. P. Le Poer Trench, be elected Vice-Presidents of the Society.

Boston Public Library.—The sum of $15,000 is required to complete the decorations in the new public library at Boston, which Mr. John S. Sargent has about half finished. The newspapers have taken the matter up, and public subscriptions to the amount of $9,725 have already been raised. So keen is the public interest in the new library that it is expected the remainder will be forthcoming in a very short time.

Die lichtempfindlichen Papiere der Photographie (the sensitive papers used in photography). A new technical work by Dr. H. C. Stiefel, published by A. Hartleben, Vienna and Leipzig, and forms Volume 218 of Hartleben's Chemi-Technical Library. A book of about 200 pages octavo, and like unto all previous works composing Hartleben's technical library, is full of practical hints and suggestions. The work, however, is not confined to the mere enumeration of photographic papers, but also contains formulas in every department of the photographic science, thus forming a handy reference book for the professional. Orders for the work can be left at the publication office of the Journal.

Tips.—To what an extent this petty system of beggary is carried on in Europe is well illustrated by an incident at the largest restaurant, near the elevated railroad station at Rotterdam. Upon a late occasion a photographic tourist, having an hour to spare before train time, with his party of four ladies went to the Cafe and ordered a lunch. It was served in a private room by the proprietor. After it was over the bill was asked for and paid. Upon leaving the same the proprietor barred the way and said, "Pardon, but Monsieur has forgotten something." Asking him what it was, as the party had all their parcels, he in the blandest manner said, "Monsieur has forgotten to fee the waiter." "But we thought that you were the proprietor." "Yes, so I am; but you are expected to fee the waiter, no matter whether Proprietor or Piccolo."

The value of training, cultivation, can hardly be over-estimated. In the home, in the school, in the church, in business, in all relations of life, continued discipline should bear its legitimate fruitage in physical and mental refinement, greater usefulness, and personal holiness. The luscious peach was once a bitter almond, and it has been said, "the cauliflower is only a cabbage with a college education." Cultivation almost works miracles in the vegetable and animal kingdoms. The mental and spiritual realms should witness still greater development.

Photographic Hints and Formulæ.

Ink Powder.—For making ink powders take

Nutgalls,	7	drachms.
Sulphate of Iron,	2	"
Gum Arabic,	3	"
Roche Alum,	1	"

Grind to powder, mix and divide into ten powders. For use dissolve one powder in four ounces of boiling water and bottle when cold.

Numbering Exposed Plates.—After having used numbered gummed labels for this purpose for a considerable time, we have come to the conclusion that numbers pencilled on the film are much more satisfactory in many ways. Labels come off during development, and the plate cannot then be identified with the notes; on the other hand a pencilled number will survive the operations of development, fixing, and washing, and be always available for reference. A printed number has also an occasional habit of transferring a developable impression of itself on to the film of any other plate with which it may be packed in contact, and while the label will vanish from its own plate the transferred number is permanent. Pencil marks on a film will not apparently have any effect upon the film of another plate even if the two are kept in close contact.

Bromide Solutions.—Plain solutions of bromides are very often recommended for the purposes of suddenly arresting development, keeping back certain portions of the image by local application, and for stopping any continuing action of the developer.

After having frequently used them for these purposes we are inclined to think, first, it is necessary to be cautious in adopting these special measures, and, secondly, that there is another use to which these solutions may be put. We have not made any systematic experiments with regard to the action of these solutions, but have noticed when making an occasional use of them that they are very liable to affect the image in a way that is sometimes detrimental and occasionally advantageous.

They are no doubt effective in retarding any future action of the developer, but they must certainly have a reducing effect upon the image that is already out, or we should rather say they convert it into silver bromide, which afterwards dissolves in the fixing solution. A weak solution of a bromide applied to a partially developed negative reduce

to a certain extent the density that has been already obtained, and a stronger solution not only reduces the density, but *destroys the finer detail.* It is therefore very advisable to use weak solutions only on such images.

If applied after development is complete, but before fixation, the same effects can be observed in a greater or lesser degree, according to the strength of the solution, and having noticed this we have, with a fair amount of success, attempted to reduce over-developed, or to clear fogged negatives by soaking them in a solution of a bromide before fixing. The details are at this stage much stronger than they are when incompletely developed, and are therefore less likely to be seriously damaged, though they are affected by a very strong solution.

Some systematic experiments with solutions of the different bromides, varying in strength, made upon images produced by various developers, might possibly lead to useful results. It will probably be found that the effect upon an amidol-developed image is much greater than that produced upon one developed by pyro, but this is only a conjecture. If fog can be reduced to a minimum by *prolonged soaking in a very dilute solution* without damage to the detail, a great deal will be gained. We have frequently cleared off surface fog in a similar manner, but as we generally did it in more or less of a hurry and used a strong solution, some of the detail went too. It is hardly safe to attempt anything in this way until development is complete, as the bromide appears to destroy the undeveloped latent image very readily, so that unless we are dealing with a bad case of over-exposure the remedy produces worse results than the disease.

As a rule we should advise that a plain solution of bromide should not be applied to a correctly or slightly under-exposed image under any circumstances excepting for the purpose of reducing over-development.

The action of the bromide upon the image is shown by the gradual formation of a white deposit; to what extent the action will go on we do not know, neither can we tell why it only takes place before fixation and not after.—*Photo Notes.*

Sifting Chemicals.—A sieve is an article not often to be found in a photographer's work-room, but is nevertheless very useful. Ferrous sulphate is a chemical that it is well to sift before making up into solutions. The crystals should be of a pure transparent green color, and any that show red specks should be rejected. As a rule, the smallest crystals are the most impure; these can easily be separated

from the larger by sifting; at the same time, the latter, being spread over the sieve, can be looked over, and any of a suspicious appearance picked out. This is a very desirable precaution to adopt if the solution is to be kept any time. Sodium sulphite is sometimes sold in the form of large crystals and sometimes in small ones; the latter variety can be treated in the same way as the sulphite of iron, and only transparent crystals selected for solution; the others, and also any in the form of a white powder, being useless.

Use of Photography in Musical Research.—The motion of a pianoforte wire when struck has been recently investigated by Kaufmann, whose paper on the subject is accompanied by a set of interesting photographic records. By vibrating the wire in front of a luminous slit, and throwing the image of it upon very sensitive paper rotating upon a cylinder, a white line is traced upon a black ground. This line, which is due to the interruption of the luminous slit by the opaque wire, exhibits all the motions of the particular point in the wire which is crossed by the slit. In order to bring the plane of the slit into exact coincidence with the wire, an image of the slit, produced by a lens with the aid of the electric arc, was thrown upon the wire itself. Since the hammer struck the wire at the point photographed, the motion of the wire was traced from the very first, the commencement of the vibration being the most interesting stage. Hard and soft hammers were tried, the latter corresponding to those actually used in the piano. It was found that the duration of contact is longer with feeble than with hard striking. As the force increases the duration of contact rapidly approaches a limiting value equal to that of a hard hammer of equal weight. But the practically most important result was the proof that when a wire is struck at a point between one-seventh and one-ninth of its length, the fundamental tone has a maximum, and the harmonics are very feeble. Hence a wire thus struck gives its strongest and richest tone.

Phometric Methods.—The determination of the times of exposure of a photographic plate which are required to produce the same density of film when exposed to different light sources, forms the basis of the methods recently adopted by Dr. Janssen for investigating the brightnesses of the heavenly bodies. In the case of stars, the plate is placed a little within the principal focus of a telescope, so that a disc, or "stellar circle," replaces the almost point-like image ordinarily obtained; a series of exposures is made on one star, and another series on the star to be compared with it; the two images of the same den-

sity are then identified, and the photographic brightnesses of the two stars are assumed to be inversely as the durations of the corresponding exposures. To compare the light of a star with the sun, an opaque screen, pierced with holes of the same size as the stellar circle, is placed in front of the photographic plate, and these holes admit sunlight to the plate at the moment when a triangular aperture in another metal plate is caused to pass over them by releasing a spring. In this way a series of circles of increasing intensity is impressed on the plate, which series can be compared directly with the stellar circles.

In its application to nebulæ, Dr. Janssen's method promises to be of great value. On the same plate which has been exposed to a nebula, a series of "stellar circles" is formed by directing the instrument to a star in the neighborhood which shows no sign of variability. It is suggested by *Nature* that in the future, when one wishes to obtain a photograph of the nebula which will be strictly comparable to one taken previously, it will only be necessary by means of stellar circles to determine the exact exposures which should be given We may add that, from an inquiry into the photographic luminosity of the tail of comet *b* 1891, Dr. Janssen finds that the intensity decreased in a ratio between the fourth and sixth power of the distance from the nucleus.

Vignetting under the Skylight.—A new device for this purpose, and which it is claimed will blend to any desired shade of background, has been placed on the market by the Rösch brothers of St. Louis. The chief merit of this new device is its simplicity, as it can be attached to any lens or camera, giving the same uniform results.

Loan Exhibition.—There will be another loan exhibition of portraits of women in New York this fall. The proceeds will be devoted to charity, as they were at the eminently successful one of last year.

Don't call a man a liar to his face. Wait and say it over the telephone. By that time you will be content to tell him he was mistaken.

Wife (to unhappy husband): "I wouldn't worry, John! It doesn't do any good to borrow trouble."

Husband—Borrowing trouble? My dear, I ain't borrowing trouble; I've got it to lend."—*Colorado Sun.*

Photographic Scissors and Paste.

Flash Literature.—It isn't a thing to smile over, either, says the *Sabbath Recorder*. The vermin that swarm in the news depots, the book stalls and on the trains are one of the ten plagues. There are the high-flown books about lords and ladies and millionaires and *millionairesses*, written in some back garret by a poor vagabond at so much a column. The worst thing they do is to impart false ideas of life and make young people dissatisfied with humbled life. There are the volumes which regard killing as an everyday matter, and plant in the boy's breast the ambition to carry a pistol and be a "bold, bad man." Far worse and more common are the novels that brush the bloom of modesty from the cheek and taint the imagination. They suggest the impurity which is plainly stated in literature such as two Chicago men were recently sent to State prison for selling.

Said Judge Grosscup when he sentenced the two men, one for three and the other for five years:

"You are vipers, and your crime is second only to murder. You men have been proved guilty of sending through the mails books and pictures [photographs] of the most demoralizing and debasing character. I would rather that a rattlesnake came into my house and crawled into my child's couch than that your vile literature were carried to him. We rarely hear of anyone disseminating the germs of some infectious disease. That would be an awful crime, but your offense is worse. I do not intend that any person shall ever hold up my court as countenancing your business in lascivious books and photographs. Your business strikes down the teachings and the years of labor that parents have given to the training of their children."

The Harnessed Cataract.—One of the greatest achievements of science in modern times is found in the diversion of a portion of the Niagara River, which is the greatest power on earth, and causing it to add to the comfort and happiness of thousands of people.

Previous to 1725 no one had ever attempted to utilize the waters of this river for any manufacturing or mechanical purpose, and at that time only to run an old-fashioned saw mill to cut lumber.

In 1885 the plan of using wheel pits was devised, and in 1886 the Niagara Falls Power Company was organized, and obtained a charter with the right to use sufficient water to produce two hundred thousand

horse-power. The total grants already secured amount to four hundred and fifty thousand horse-power.

The water to produce this wonderful power is taken from the river a mile and a half above the Falls and two thousand feet in a northeasterly direction to the pits, where it is pitched into enormous steel pipes or pen-stocks, at the bottom of which are located the ponderous turbine wheels for the transmission of the power. The tunnel for carrying away the water after its use at the pits is over a mile and a quarter in length, 21 feet high and 14 feet wide, cut through rock at a distance of two hundred feet under the city of Niagara. This is said to be the largest hydraulic tunnel ever made.

The penstocks are seven feet in diameter, and one hundred and forty feet high; the wheel pit now in use is one hundred and seventy-eight feet deep, twenty-one feet wide, and one hundred and forty feet long. The penstocks come down under, and are made to discharge upwards into the wheels so that the water shall be made to bear the great weight, not only of the heavy turbine wheels, but the one hundred and forty feet of large upright shafting above. The wheels at present connected with these two penstocks are calculated to develop five thousand horse-power each.

This enormous power when completed is for generating electricity to be used in lighting all the cities as far east as Albany, towing the canal boats on the Erie Canal, and for supplying power to mills, factories, and other machine shops as may be required. It has been estimated that when all the water has been used as contemplated it will not diminish the depth on the Fall one inch. Power works are being projected on the Canada side. April 6, 1895, the first and second tests of the great 5,000 horse-power dynamos were made and are perfectly satisfactory.

Not the Photograph, but his poor writing was to blame. Here is a new anecdote from *Harper's Magazine:* "It's a bad thing not to write a legible hand," said the Philosopher, knocking the ashes from the end of his cigar. "Sometimes most unpleasant complications arise from the habit of not writing clearly. I remember a row I once had with my friend Darby because of it. Darby had sent me a photograph of his wife with her four little ones, two on her lap and one peering over each shoulder. The children were great friends of mine, and he knew I'd like to have it. I immediately acknowledged its receipt to Mrs. Darby, and closed by saying that she looked like a beautiful rose tree—the idea being that she was the tree and the children the

roses." Very nice idea," said I. "Yes," returned the Philosopher, sadly, "but my handwriting ruined it all. Darby met me on the street a few days later, and coldly inquired what I meant by writing to his wife and telling her she looked like a dutiful rooster."

The Government as a Great Publisher.—How vast a business is carried on by the Government Printing Office may be gathered from the fact that more than 3,000 operatives are employed, at wages aggregating about $2,900,000 a year; that 40,888,598 copies of separate documents were printed in 1894; that the number of pages of type set the same year was 286,152 (exclusive of the Congressional Record), and that for a single Report (that of the Secretary of Agriculture) more than 1,000,000 pounds of book printing paper was required. The statement frequently made that this is the most extensive printing-office in the world is borne out by its operations, although by no means true of its building. The latter is to the last degree unsuited to so vast a business, being old, overcrowded, and notoriously unsafe. The rapid development and increase of government printing is shown conspicuously in the figures of its annual cost. In 1819, all the printing and binding of the Government required an expenditure of only $65,000. In a Report made to Congress in 1859, the whole cost from 1819 to 1853 was stated at $3,574,343, while the printing for the six years 1853 to 1859 cost $3,462,655; or about as much in six years as in the previous thirty-three years. This extravagance led to the final establishment of the Governmant Printing Office; and the greatly expanded business of multiplying books and documents ever since is shown in the figures of annual expenditure, which were in 1863, for printing and binding, $1,417,750; in 1870, $1,609,860; in 1880, $2,034,751; in 1890, $3,124,462; and in 1894, $3,940,410. The cost of government printing and binding in Great Britain in 1894 was £522,500, or about $2,600,000; but as this included stationery for all the public offices, and as no free document distribution exists there, except one copy to each member of Parliament, there are far more elements of contrast than of comparison.—*Ainsworth R. Spofford in the May Forum.*

Fun in a Grocery.—It was an Atchson colored girl who paralyzed the grocer by calling for twenty-five cents' worth of paralyzed sugar, three pounds of desecrated codfish and a can of condemned milk.

HINTS IN PRONUNCIATION.

NAMES AND WORDS OVER WHICH WE SOMETIMES STUMBLE.

Verestchagin, painter of the celebrated picture, "The Russian Feast," is aged 51 years. Two of his friends have informed me that his own pronunciation of his name is Vert-shah-gin, second syllable accented.

Munkacsy, the Hungarian painter of the well-known picture, "Christ before Pilate," pronounces his name Moon-kotch-e, second syllable accented.

Mr. Gladstone, prime minister of England, pronounces his name Glad-stun, first syllable accented.

Mr. Carnegie, founder of the New Music Hall, located in West Fifty-seventh street, New York, pronounces his name Car-na-gy, second syllable accented.

Colquhoun, the Scottish statistical writer, died in 1870, aged 76 years. The pronunciation of his name is Ko-hoon, second syllable accented.

Coleridge, the English metaphysician and poet, died in 1834, aged 62 years. His name is pronounced Coalridge.

D'Aubigné, the French historian, author of "History of the Reformation," died in 1872, aged 78 years. His name is pronounced Do-bean-yá, last syllable accented.

Meissonier, the celebrated French painter, died in 1891, aged 78 years. His name is pronounced May-sown-yá, last syllable accented.

Boulanger, French general, died in 1891, aged 54 years. His name is pronounced Boo-long-zhá, last syllable accented.

Boucicault, the Irish dramatist and actor, died in 1892, aged 70 years. His name is pronounced Boo-se ko, last syllable accented.

Desmouslins, French revolutionist, died in 1794, aged 34 years. His name is pronounced Da-mou-lan, last syllable accented.

"Meistersinger Von Nurnberg," pronounced My-ster-zinger Fon Neernbaerg. An opera; words and music by Richard Wagner, completed in 1867 and first rendered at Munich in 1868 under the direction of Von Bulow.

Michael Angelo, Italian painter and sculptor, died in 1562, aged 88 years. The Italian pronunciation of the name is now given the preference, Mick-el-on-jel-o. The i has the sound of i in pickel, third syllable accented.

In the Twilight Hour.

HASTE is half-bother to delay.

THOUGHTS are the eggs of actions.

YOU cannot avert a hurricane by refusing to believe it is coming.

THOSE who are strongest in argument are oftenest weakest in soul-saving.

THE "chief end" of the average man is to get other people to do his share of the work while he gets their share of the pay.

EDUCATE men without religion and you make them but clever devils.—*Duke of Wellington.*

WE must not fear to be called "eccentric." That word means "out of centre," and if we are in the true centre, in the orbit of obedience, we shall be out of centre as to the world.—*Arthur T. Pierson.*

WHEN we are most religious we are most inclined to proclaim the law. It is a poor rapture that does not come down upon legislation with a new force, a firmer grip, and a deeper conception of its moral solemnity.

WE should read books, not to quote them, but to strengthen our intellects and to suggest thoughts of our own. We fatten our sheep with grass, not to obtain a crop of hay from his back, but that he may feed us with mutton and clothe us with wool.—*Anon*

MEN give me some credit for genius. All the credit lies in this: When I have a subject in hand, I study it profoundly. Day and night it is before me. I explore it in all its bearings. My mind becomes pervaded with it. Then the effort which I make the people are pleased to call the fruit of genius. It is the fruit of labor and thought.—*Alexander Hamilton.*

LOVE seeks not inlets, but outlets.

SIN can always convince the willing heart.

TO-MORROW'S burdens are always heaviest.

THE consequences of sin are not so terrible as sin itself.

ROBBING the furrow ruins the farm. To get we must give.

ONLY actions give life strength; only moderation gives charm

NATURE is so thin a screen; the glory of the one breaks in everywhere.

AN iceberg never thawed an iceberg. The more they rub up against each other the colder they get.

FENCING the fields is not tilling the soil. Denominational lines may be necessary, but should not be made of first importance.

A WOMAN can tell more about her husband's religion by the way he behaves when she asks him for money, than she can by hearing him make a long prayer in church.—*Ram's Horn.*

"THE world owes me a living." Those were the words a young man used the other day, but he may possibly be mistaken and quite likely he was; it just depends upon how much capital he has on deposit in the world's bank in the way of character and earnest manhood; he should not draw out more than he puts in, but the trouble is that his figures and those at the bank would not agree, so that he imagines himself abused, while in reality his account is already overdrawn —*Wooster Voice.*

BARGAIN LIST.—JULY, 1895.

PORTRAIT CAMERAS.

[For Lenses see Special List.]

1—11x14 Portrait Camera, with 8x10 attachment, . . . $60 00
2—8x10 D. S. B. Portrait Cameras, each 15 00
1—8x10 D. S. B. Portrait Camera, with Benster Holder, . . . 25 00
1—14x17 D. S. B. Portrait Camera, 40 00
1—5x7 Victoria Camera, 4 ¼-lenses, ... 18 00
1—5x7 Victoria Camera, ... 8 00
1—5x7 Victoria Camera, ... 9 00
1—5x8 Stamp Camera 15 00
1—5x8 Wet Plate Stereo. Camera, 3 holders, ... 20 00

VIEW CAMERAS.

1—6½x8½ View Camera, 1 holder, lense and tripod, ... 12 50
1—5x7 New Model Outfit new . . 9 00
1—6½x8½ View and 2 holders . 8 00
1—6½x8½ S. S. View Camera, Shutter and Eagle Lenses, . 35 00
1—4x5 NewModel Improved Camera, ... 11 90
1—8x10 View Camera and Holder, new, ... 16 00
1—5x8 New Model Camera, . . 10 00
1—8x10 Eastman Reversible Back Camera 25 00
1—6½x8½ Novelette Camera, new, ... 20 00
1—5x8 Blair Single Swing View Camera 15 00
1—6½ x 8½ American Optical Co.'s View Camera, ... 20 00
1—5x7 Blair Rev. Back Camera, new 25 00
1—5x8 Boston Rev. Back Camera, new 25 00
1—¼ Eclipse Outfit, ... 2 00
1—5x8 '76 Camera, Holder, Tripod, and Case, ... 23 00
1—5x7 View Camera, ... 7 00
1—5x8 Blair Rev. Back Camera, and 4 holders, ... 25 00
1—14x17 Ideal Camera, holder, tripod, Orthoscope lens and case, ... 100 00
Without lens, ... 40 00

HAND CAMERAS.

1—4x5 Tuxedo Folding, 4 holders 12 00
1—No. 1 Kodak, ... 10 00
1—A Ordinary Kodak, new, . . 5 00
1—5x7 Folding Kodak, new, . 55 00
1—C Daylight Kodak 15 00
1—4x5 Climax Detective, new, . $18 00
1—4x5 Turnover Detective, new, 15 00
1—4x5 Montauk Detective, new, 18 00
1—4x5 Hawkeye, Darlot lens, 3 holders, list $33, ... 18 00

ACCESSORIES.

1—Magic Camera Stand 6 00
1—Seavey Balustrade 5 00
1—Seavey Vase 2 00
6—5x7 Printing Frames, each, . 25
10—6½ x 8½ Printing Frames each, ... 35
1—10-in. Burnisher, double roll . 8 00
1—14-in. Drag Burnisher, . . . 5 00
3¼x4¼ Washing Boxes, each, 50
5x7 and 5x8 Washing Boxes, 1 00
1—8 ft. Show Case 12 00
—Large Oak Show Frames, each 5 00
1—8x10 Knickerbocker Stand, . 5 00
1—Corner Chair, Velvet, list $20, 10 00
1—Cooper Enlarging Bromide Lantern, 8 in condenser . . 35 00
1—11-in. Acme Burnisher. . . . 12 00
1—14-in. Eureka Burnisher, . . 18 00
1—15-in. Improved Eureka Burnisher 25 00
1—15-in. Acme Burnisher, . . . 20 00
1—Acme Print Trimmer, new, . 10 80
1—Baldwin Print Cutter, new, . 14 00
Lot of Picture Mats. Write for particulars.
1—14x17 Printing Frame, . . . 1 25
1—18x22 Printing Frame, . . . 2 50
1—11x14 Printing Frame, . . . 1 00
1—8x10 Printing Frame, ... 40
1—10x12 Adaptable Washing Box 3 00
1—14x17 Adaptable Washing Box 4 50
1—19x24 Deep Agate Tray, . . 5 00
2—6x8 Children's Backgrounds, 3 00 and 4 00
2—8x10 Bryant Backgrounds, 6 00 and 7 00
1—Wall Accessory, ... 4 00
1—Daisy Foreground, ... 4 00
1—Seavey Swiss Cottage 8 00
1—Osborne's Rock Accessory, . 10 00
1—Osborne's Pillar Accessory . . 15 00
Lot of second-hand backgrounds, 8x10 and 6x8, $3.00 to $6.00; write for particulars.
Peerless Varnish Pots, each . . . 40
Full line of Packard Brothers' Grounds *in stock*. Interiors $5.00; exteriors, $4.00.
3—Junior Ruby Lamps, each, . 60
1—4¼x5½ Negative Box . . . 35
1—Walmsley Reversible Finder . 2 50
1—Card-size Burnisher 3 00

1—8x10 Porcelain Tray, Deep, . 50
1—Dana Chair, new, ... 6 50
1—Divan, Small, new, ... 3 00
1—No. 2755 Rattan Chair, new, . 6 50
1—Magic Camera Stand, ... 7 00
2—22x28 Moorehouse Display Albums, each 10 80
1—Williams Flash Lamp, . . . 75 00
2—Air Brushes, complete, good as new, ... 25 00

Bargains in Lenses.

1—4x4 Portrait Lens 10 00
1—4x4 Darlot Portrait, ... 12 00
1—¼ H B and H Lens, ... 3 00
1—3 B Dallmeyer lens for cabinets, ... $130 00
1—½-Size Dallmeyer lens for cabinets, ... 50 00
1—8x10 Dallmeyer R. R. Lens, list $74, ... 45 00
1—5x7 Euryscope Lens, Prosch Shutter, ... 35 00
1—¼ Voigtlander Lens, ... 9 00
1—6½x8½ Gundlach Single Lens 3 50
1—5x8 Gundlach Star Lens, . . 12 00
1—8x14 Gundlach Star Lens, . . 10 00
1—11x14 Darlot R. H. Lens, list $45, ... 30 00
1—5x8 Darlot R. H. Lens, . . . 15 00
2—4x5 Darlot R. H. Lens, each 10 00
1—10x12 Blair Orthographic, . . 20 00
1—5x8 Wide Angle Lens, . . . 5 00
2—6½x8½ Wide Angle Lens, ea. 8 00
1—11x14 Wide Angle Lens, . . 18 00
1—Pair Waterbury Stereo Lenses, 4 50
2—R. R. Detective Camera Lens, 3 00
1—Set 1-9 Gem Lenses, ... 16 00
1—¼ Gem Lens, ... 1 50
1—4-4 Jamin Globe Lens, . . . 12 00
1—¼ Holmes, Booth & Hayden, 4 00
1—6½x8½ E. A. Single Lens, . 5 00
1—6½x8½ Single View Lens, . 3 50
1—5x8 Single View Lens, . . . 2 00
1—6½x8½ R. O. Co's. View Lens, 2 00

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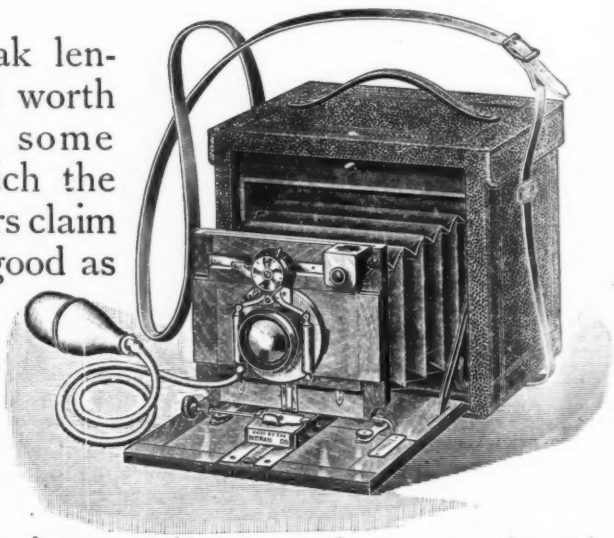

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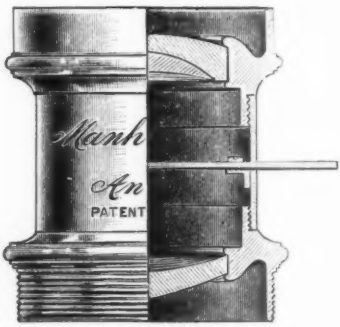

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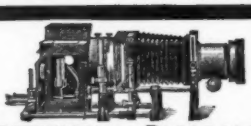

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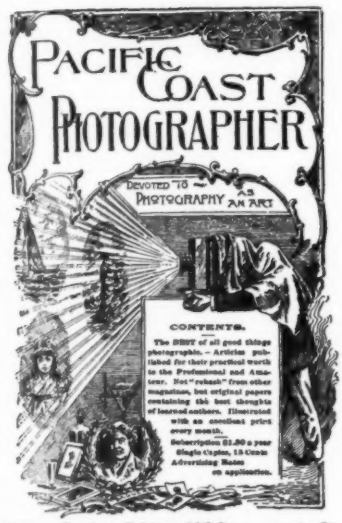

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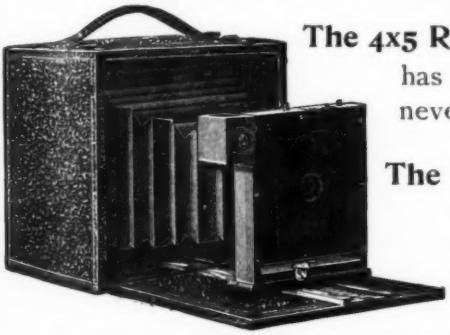

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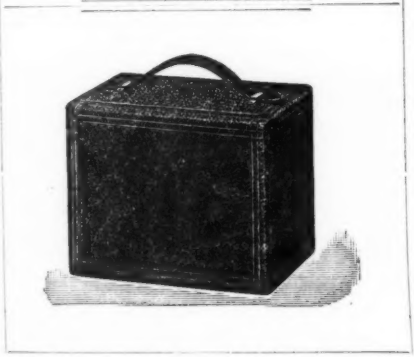

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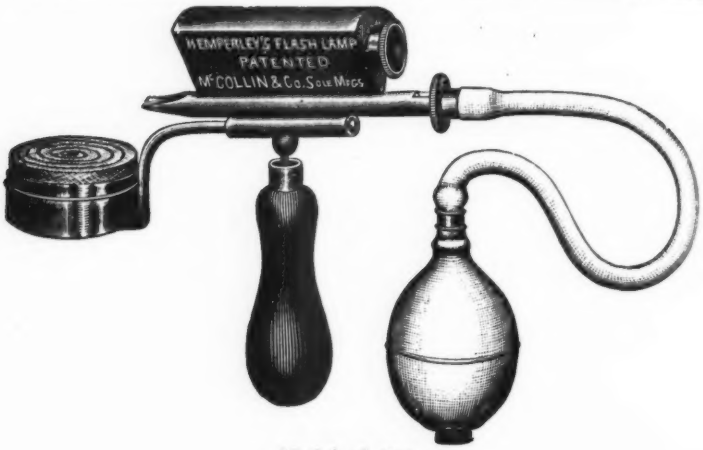

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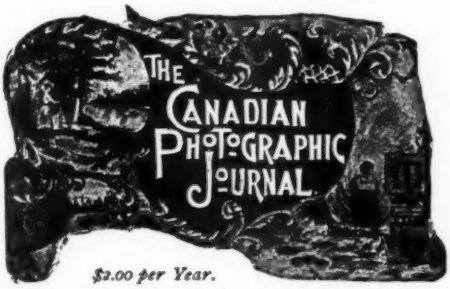

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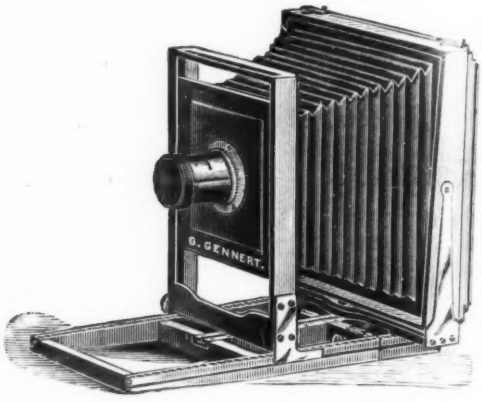

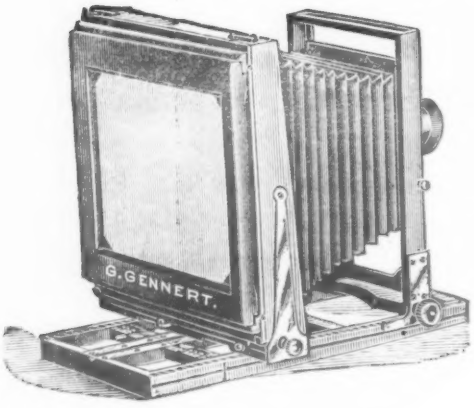

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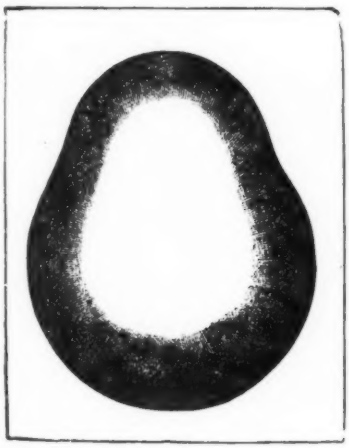

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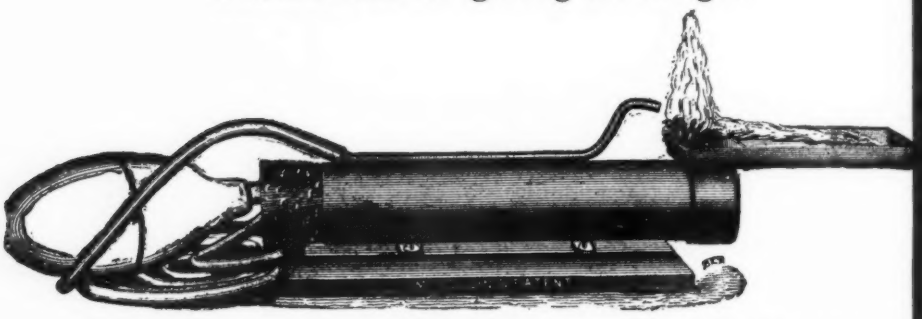

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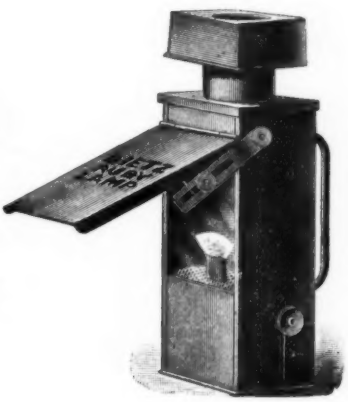

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OFFICIAL PAPER OF BAYFIELD COUNTY.
FRED. T. YATES, EDITOR AND MANAGER

THE WASHBURN NEWS.

WASHBURN, WIS., March 8, 1895.

Acme Cycle Co., Elkhart, Ind.

DEAR SIRS:—I am in receipt of your letter of recent date, regarding advertising for this year. The wheel I got of you last year proved more than satistory. It received particularly hard usage but stood the test well. I now want one of your 22 pound wheels. Have you this in stock. An early answer will oblige,

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Very truly yours,
W. B. WILCOX,
Spokane, Wash.

THE TRANSCRIPT.

Editorial Office. A. P. HOUGH

TRAVERSE CITY, MICH., MARCH 8, '95.

Acme Cycle Co., Elkhart, Ind.

DEAR SIRS:—The Light Roadster arrived yesterday, and your letter just now. Everything is entirely satisfactory, and the wheel will be paid for to-day. Electro has not arrived yet, but will be inserted in this week's issue if received to-day. If not will have to go over till next week. I appreciate your prompt and courteous treatment, and will endeavor to satisfy you as well as you have me.

Yours truly, A. P. HOUGH.

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SAN FRANCISCO, CAL., February 16, 1894.

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[Signed] WILLIAMS & SHEPARD,
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CORTLAND, N. Y., October 8, 1894.

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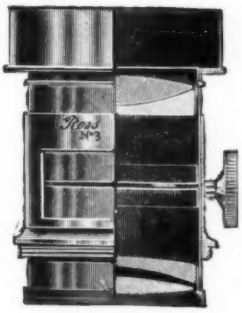

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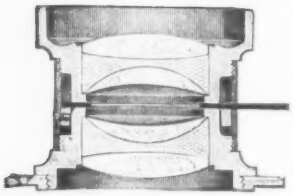

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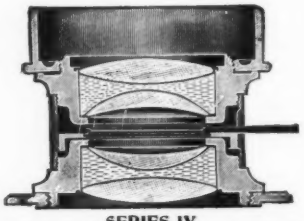

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